

Measurement and modeling: Sequential use of analytical techniques in a study of risk-taking in decision-making by school principals

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Measurement and modeling: Sequential use of analytical techniques in a study of risk-taking in decision-making by school principals in Western Australia

Abstract

This paper investigates reasoned risk-taking in decision-making by school principals using a methodology that combines sequential use of psychometric and traditional measurement techniques. Risk-taking is defined as when decisions are made that are not compliant with the regulatory framework, the primary governance mechanism for public schools in Western Australia. This creates a dilemma for principals who need to be able to respond to the locally identified needs within a school, and simultaneously comply with all State and Commonwealth departmental requirements. A theoretical model was developed and data collected through the survey of a stratified random sample of principals in 253 Western Australian government schools. Rasch measurement was used to create a measurement scale. The hypotheses were tested using Partial Least Squares (PLS) structural equation modeling. This analysis provides evidence of the effect of governance structures, characteristics of schools and principals that influence decision-making in schools.

Keywords: Measurement; structural equation modeling; decision-making; risk-taking; governance.

Background

This paper considers the impact of risk-taking in decision-making by school principals of public schools in Western Australia. Western Australia is one of six States in Australia. It is geographically diverse including one capital city, a number of regional centres, and remote isolated communities, many of which include large proportions of Indigenous students. Such schools can have diverse needs that are not aligned to centrally developed policy requirements. The Department

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of Education is the state public sector agency responsible for the provision of education at government funded schools throughout Western Australia. Principals of public schools are provided with guidance for their decision-making by centrally developed educational policy and procedures included on the regulatory framework. The regulatory framework provides a mechanism for assuring regulatory compliance across the Department. The regulatory framework consists of the Acts, Regulations, delegations, policies and procedures that together establish the mandatory rules of operation for all officers of the Department of Education employed in the provision of education in public schools.

In Western Australia the Independent Public Schools initiative was announced by the State Government in August 2009 (Colin Barnett MLA, Premier and Dr Elizabeth Constable MLA, Minister for Education, Government media release, 12 August 2009). The initiative is aimed at reducing bureaucracy in the Western Australian public school system by the provision of greater decision-making autonomy, authority and flexibility to public school principals through greater decentralisation (Department of Education and Training, 2009). In 2010 the Department provided this greater flexibility in governance to 34 Independent Public Schools. In July 2010, a second intake of 64 schools was announced to commence operation at the beginning of 2011. A third intake in May 2011 has brought the total to 207 Independent Public Schools (Department of Education, 2011). This represents 27% of public schools in Western Australia. A further 141 expressions of interest have been submitted in 2012 (Department of Education, 2012). These selected schools are being provided with autonomous control such as currently occurs in independent private schools. With a license to operate outside of the governance mechanism of the regulatory framework that currently controls their decision-making processes, these schools will have greater autonomy than those operating under the regulatory framework.

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The issue of devolution of school decision-making, the impact of management demands and the requirements of central education authorities in constraining innovation in schools has been an issue of debate for many years (Sarason, 1982; Bennis & Nanus, 1985; Sergiovanni, 2000; Starr, 2008). The dichotomy created by decentralisation, in combination with increased external accountability, creates a dilemma for school principals in Australia. Principals have the dual task of being instructional leaders to ensure that students attain achievement standards and simultaneously lead and manage the organisation of the school. As each school is a component of a larger organisation, there are requirements imposed from the organisational executive regarding both educational and business aspects of the leadership role of principals.

Since the 1960's the political climate of Western nations, and demands of cultural minorities and the feminist movement for increased participation, have contributed to the rise of school-based decision-making and management as an administrative strategy in education (Seddon, Angus & Poole, 1990, pp.29-41). In a comparison of 19 countries, the 2004 Organisation for Economic Co-operation and Development (OECD) report found that in 14 countries, decisions were being made at a more decentralised level in 2003 than was evident in 1998. In contrast to this, Australia was found to be one of the countries with the most centralised educational decision-making (Caldwell, 2006, p.65). This is despite research and government reports, such as the Karmel Report (1973, p.10), recommending that Australian schools move towards a more decentralised form of management. A commitment to decentralisation and devolution of authority in education was made at a national level following the election of the Australian Labor Party in 1983 (Caldwell, 1990, p.5) and national and state government initiatives over recent years are still tending to move in this direction (Eacott, 2009; Department of Education and Training, 2009).

The policy trend towards decentralisation came to the political fore in Western Australia in 2001, with the publication of two government reports that focused specifically on Western Australian

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public schools. The *Evaluation Study of the Local Management of Schools Pilot Study* (Cummings & Stephenson, 2001) indicated that “the bureaucratic nature of Central Office and the plethora of rules were identified as impeding progress with local management”. Similarly, the report, *Investing in Government Schools: Putting Children First*, (Robson, Harken & Hill, 2001) found that administration through system-wide management policies does not recognise the diversity that exists across education districts. The report stated that “locally-managed schools are seen as being more responsive to local needs” (Robson, Harken & Hill, 2001, p.13). The implication of these reports was that there is a risk that over-regulation could act as a barrier impeding innovation and the flexibility to implement the most appropriate response in schools given local community opportunities, considerations and conditions. Caldwell (1990, p.19) expressed the view that the key to the management of the conflict around decision-making in schools that has arisen from centralisation of policies is “dependent on minimizing the number of constraining rules and regulations”. Similarly, Wong (1997) indicated that one of the major strategies for reducing bureaucratic power in education is the empowerment of professionals to be involved in shared decision-making on policy at the school site.

Much of the literature on models of strategic decision-making and risk-taking behaviour relates to studies that have been conducted within business environments. Within these studies agency and behavioural perspectives have been used to develop theories of risk-taking where the nature of risk-taking is a consequence of governance mechanisms and stakeholder characteristics including the experience of management. For example, Carpenter, Pollock and Leary (2003) provided some evidence of the critical role of boards and management, as a component of corporate governance, on strategies involving reasoned risk-taking and that the risk attitudes and experience of individual principals and agents can influence reasoned risk-taking strategies of firms. The study reported in this paper sought to apply these theories to the public sector environment, specifically by

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principals in public schools. Decision-making in the public sector is controlled by the governance mechanism of regulatory frameworks that include legislation, regulations and departmental policies. Reasoned risk-taking occurs when decisions are made that are not compliant with the regulatory framework. The study used agency (Hoskisson et al. 1999; Rumelt, Schendel & Teece, 1991) and behavioural (Wiseman & Gomez-Mejia, 1998) perspectives to determine whether the reasoned risk-taking by school principals is a consequence of their perceptions of the governance mechanism of the regulatory framework, the experience of principals and the characteristics of key stakeholders within the school community.

Methods

A model of risk-taking in decision-making by school principals was developed and validated in the study by Trimmer (2011). The model, and the associated questionnaire to measure constructs composing it, were developed with reference to the literature and conclusions from an earlier qualitative study (Trimmer, 2003a, 2003b). The 2003 study involved interviews with public school principals and district office administrators across the state of Western Australia.

Preliminary data were collected through face-to-face interviews with principals and district directors in each of the 16 district education offices across Western Australia. In addition, interviews were conducted with representatives of key stakeholder groups. This data were used, in conjunction with the literature review, to develop the research model in Figure 1.

Insert Figure 1 here . Research Model

The constructs included in the research model include:

Regulatory framework governance mechanism - The regulatory framework is the collection of policy and procedures documents disseminated to schools from the central office of the Department of Education. Compliance with these instructional statements of policy is mandatory for

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all staff in public schools in Western Australia. Governance structures can influence how decisions are made (Panova, 2008).

Compliance mechanism or educative mechanism – A clear distinction that arose from interviews with principals was whether they perceived the regulatory framework as a compliance mechanism to control their decision-making or an educative mechanism to guide them. Sitkin and Pablo (1992) posit that the focus of the organisation's control system, on either process or outcomes, impacts on perceptions of risk and hence decision-making behaviour. They argue that control systems that focus on the process by which decisions are made lead to perceptions of lower risk whereas those that focus on outcomes, ignoring how the decision was made, lead to perceptions of higher risk. In the public school context, the compliance view of the regulatory framework focuses on process, whereas an educative view focuses more on assisting a principal to achieve an appropriate outcome.

Experience - Carpenter, Pollock and Leary (2003) found that decision-making was impacted by previous experience, with individual risk-taking more likely where management had relevant experience. Wiseman, Gomez-Mejia and Fugate (2000) indicated that this was because differing levels of experience can affect expectations related to magnitude and probability of loss associated with taking a particular risk. The rationale being that the greater a manager's experience and past success with dealing with an action, the less uncertainty that manager will have regarding the likely outcome of taking the action, and the more reasonable the risk will seem. In the context of schools, experienced principals are likely to have had the opportunity to be involved in decision-making situations in the past that will reduce their uncertainty and inform their future decision-making. Experienced principals would therefore have greater propensity to engage in risk due to their reduced uncertainty and a perception of risk based on greater knowledge of similar situations. Conversely,

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new and acting principals, who have limited experience, would be more likely to refer to and comply with the regulatory framework as a guide to their decision-making in situations of risk.

Stakeholder characteristics - Studies by Carpenter, Pollock and Leary (2003) and Carpenter and Westphal (2001) examined the critical role of stakeholders in reasoned risk-taking and strategic decision-making. Beatty and Zajac (1994) have argued that influential stakeholders encourage risk-taking by managers. In the context of decision-making by school principals the stakeholders include parents and community members in the school locality. Where a school is located in a community that differs from the norm, the expectations and needs of the community are more likely to be unique to that particular community. Differences could be due to factors including geographical location or cultural influence such as would occur in remotely located communities. The expectations and needs of such a community are less likely to align well to policies that have been developed centrally to apply to generally applicable circumstances. It is therefore posited that there will be greater influence on principals from the parent and community stakeholders in these communities to take risky decisions in order to meet their differing needs and expectations.

Reasoned risk-taking in decision-making - Risk-taking is defined to occur when decisions are made that are not compliant with the regulatory framework, the primary governance mechanism for public schools in Western Australia. Decisions contrary to the regulatory framework involve risk as when negative outcomes arise from decision-making, principals may be exposed to criticism or disciplinary action for non-compliance with established policy.

Five hypotheses were developed to address the research questions and analyse the research model.

Hypothesis 1: More experienced principals will tend to engage in risk-taking behaviour more frequently than new or acting principals.

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Hypothesis 2: Where school principals interpret the governance mechanism of the regulatory framework as a compliance mechanism there will be a negative relationship to reasoned risk-taking.

Hypothesis 3: Where school principals interpret the governance mechanism of the regulatory framework as an educative mechanism there will be a positive relationship to reasoned risk-taking.

Hypothesis 4: There will be an interaction effect between perception of the regulatory framework and experience. (a) The relationship between the compliance mechanism and reasoned risk-taking is moderated negatively by the experience of principals.

(b) The relationship between the educative mechanism and reasoned risk-taking is moderated positively by the experience of principals.

Hypothesis 5: Principals of schools with a high degree of uniqueness in the characteristics of key stakeholders within the communities will be more likely to make decisions involving reasoned risk-taking.

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A survey questionnaire was developed to measure the constructs included in the research model. Measurements in existing studies related to business environments were not transferable to an educational context. Therefore, measurement items were developed for each of the constructs included in the research model. These included measures of both attitude and behaviour of principals to determine whether reasoned risk-taking by school principals is a consequence of their perceptions of the governance mechanism of the regulatory framework, the experience of individual principals and the characteristics of key stakeholders within the school community. The survey questionnaire was piloted with a small sample of principals from both metropolitan and remote primary and secondary schools. The refined version of the survey questionnaire was then used to collect confirmatory data to test the research model. Data were collected from a stratified random sample of principals in 253 Western Australian public schools of which 140 responded.

Analysis

A combination of Rasch and structural equation modeling, were applied to test the measurement properties of the questionnaire and the hypothesised model. The choice of analytic techniques was made to provide the strongest evidentiary base to support the validity of the theoretical model. Cavanagh and Romanoski (2005) point out that “although these techniques are based upon different psychometric traditions, each has utility in specific aspects of hypothesis testing and measurement”. Rasch analysis was conducted with RUMM version 2020 (Andrich, Sheridan, & Luo, 2005) to explore the psychometric properties of the measurement instrument. Having established that the questionnaire provided a valid and reliable scale of measurement, the hypotheses were tested using structural equation modeling. The structural equation modeling was conducted using Partial Least Squares (PLS) version 3.0 (Chin, 2001).

Structural equation modeling and other path analysis techniques have been more frequently used in educational based research in recent years. However, there are opportunities for greater use

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of such techniques in understanding schools and their effectiveness. The study reported in this paper combined structural equation modeling with Rasch analysis. Cavanagh and Romanoski (2005) contend that the Rasch methodology allows identification of measurement errors due to item or person misfit during scale construction, allowing the errors to be minimised prior to testing of the model with traditional techniques. Structural equation modeling includes an assessment of the measurement model as a component of the analysis. However, the presence of errors of measurement and their influence on the fit of the data to the model are only revealed after the fit statistics have been estimated. Cavanagh and Romanoski (2005) posit that the presence of such errors could prevent model confirmation. Following conduct of the Rasch analysis, items identified as demonstrating errors were removed from the analysis before undertaking the structural equation modeling analysis.

Rasch Analysis

Rasch analysis (Rasch, 1960/1980; Andrich, 1988 & 1989; Lunz & Linacre, 1998) was the methodology used to examine the psychometric properties of the questionnaire data collected to test the research model of reasoned risk-taking in decision-making by school principals. The procedure involves scaling the results on each item in the questionnaire relative to responses on the other items. The procedure for analysing differential performance uses the principles of latent trait theory. The model requires that there is a single latent trait which governs the responses of all persons to all items. In this case this trait would be reasoned risk-taking in decision-making. This component of the analysis aimed to produce a measurement scale of the attitudes and behaviours of school principals towards risk-taking in decision-making.

The use of Rasch analysis has several strengths in relation to traditional statistical techniques. Application of the Rasch measurement model requires that variables be measured in common units and also that persons and items are positioned on the same interval scale. In addition,

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the calibration process for Rasch analysis ensures that the scales developed are linear. “Testing the psychometric properties of data from a scale using classical techniques will not reveal errors due to item disordering” (Cavanagh & Romanoski in Waugh, 2005, p.68). Cavanagh and Romanoski (Waugh, 2005) and Cavanagh and Waugh (2004) indicate that measurement errors due to disordered Likert scale responses are undetected by traditional techniques, whereas items where respondents have not answered consistently or logically can be detected using Rasch and omitted from further analyses. Use of the measurement stage of structural equation modeling analyses provides tests of the reliability of the items in the model and information about their functioning. However, Cavanagh and Romanoski (Waugh, 2005) point out that structural equation modeling will not reveal errors due to item disordering or test whether the respondents have answered survey items consistently and logically. Rasch psychometric scale analysis provides insight into these additional sources of measurement error.

Rasch analysis enables validation of the data on the items in the questionnaire and persons responding to it and develops an interval scale comprised of items that are determined to fit the model. The algorithm in the program (Andrich, Sheridan & Lyne, 1991) uses a pairwise procedure, and providing there is no overlap in the response patterns, it handles missing data routinely. Therefore it was able to handle the items to which a principal did not respond.

For an item to fit the Rasch model, persons with a high level of the attitudes on the latent trait should have a higher probability of strongly agreeing or agreeing to an item than persons with a lower level of these attitudes and behaviours. In this analysis item thresholds were calculated. The existence of disordered thresholds indicates items that are not operating logically or consistently in regard to response categories provided on the Likert scale. Items with disordered thresholds were discarded from further analysis. Items to which all respondents either agreed or disagreed were also discarded as these items failed to adequately discriminate between respondents.

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The retained items were subsequently examined for low residuals and high Chi Square probability. The residual for an item is the difference between the actual response and the expected response to the item as predicted by the measurement model. A low residual of $< \pm 2.0$ indicates that the item fits the model, whereas a high residual shows poor fit to the model. The Chi Square estimates the probability that the item's data fit the model. A probability value with $p < 0.05$ shows poor fit to the model. One item with a high residual and a high Chi Square was discarded from further analysis. However, the individual item-fit statistics showed that the retained items fit the model.

For most accurate measurement of persons on a trait, item difficulty should be matched as closely as possible to the person's attitude levels as the standard errors of measurement are least in this case. The item map in Figure 2 shows the distribution of the attitudinal and behavioural items and also the location of principals on the measurement scale. For this questionnaire the difficulty level estimates of the items ranged from -3.901 to 4.523 , whereas the attitude level estimates for the principals ranged from -2.71 to 1.201 . All of the items with difficulty levels above 1.201 referred to behaviours. Andrich and Styles (1994) have found that behavioural items tend to be more difficult to agree to than attitudinal items. They have argued that attitude and behaviour statements fall on the same measurement continuum with behaviour statements at the higher end as they are harder items to agree to. Thirteen of the 17 behavioural items on the questionnaire had difficulty locations above zero, the mean of the measurement scale.

Insert Figure 2 here. Item Map showing the person/item distribution with the items identified

Note: Demographic items 1 – 12, attitude items 13 – 47, and behaviour items 48 – 61.

The variance among attitude estimates relative to the error variance for each person was acceptable. The separation index, an index similar in principle to the traditional reliability index (Andrich, 1982) can be calculated as the ratio of the estimated true variance of ability relative to the

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observed variance. The value in this case was 0.63 which indicates the power for test-of-fit is “reasonable”. Analogous to the traditional reliability index, the greater the variation in person attitudes the greater the opportunity for the ordering of persons to reveal itself. As the variation in persons’ attitudes becomes extreme the separation index tends to one and as variation in persons tends to zero the index of separation tends to zero also. A separation index close to zero would indicate that the differences among the attitude estimates of principals were no greater than would be expected by chance relative to the error of measurement. Re-analysis of the data with items with disordered thresholds and the item with misfitting statistics removed, did not improve fit with the model. The separation index was 0.59 and the power for test-of-fit “reasonable”. Andrich, Sheridan & Luo (2005, p.35) advise that this is a common problem when discarding items as precision of measurement is reduced when items are eliminated.

The statistical procedures employed in the data analysis resulted in data for 12 items in the questionnaire being discarded from analysis using structural equation modeling. However, the data retained complied with the stringent measurement criteria applied providing confidence in the constructs measured by these data in the research model. Cavanagh & Romanoski (Waugh, 2005) indicate that reduction of measurement items through the use of statistical and conceptual procedures during an empirical investigation is acceptable and improves the measurement properties of the survey instrument. They discuss a study of school classroom learning culture where two thirds of the items from their original survey were discarded following Rasch analysis leaving a scale of logical elements for the constructs of interest. Cavanagh & Romanoski then used structural equation modeling to examine the interaction between the elements of the statistically validated structural model.

Structural equation modeling

The analysis discussed above provided assurance that the measurement model was valid and reliable to a degree that would allow confidence in using the measures to test the structural model.

The next part of the analysis examines the relationships among the constructs to determine whether the measured data support the structural model hypothesised.

The PLS technique utilises a jackknife or a bootstrap procedure to test the significance of parameter estimates (Chin, 2001; 1998). The goodness of fit of the model was tested using the root mean square error of approximation. This essentially provides a measure of the predictive power of the model in that it demonstrates how much of the variance in the construct is explained by the model (Barclay, Thompson & Higgins, 1995). The hypothesised model is useful if it has predictive validity in that the exogenous variables predict the endogenous variable, *reasoned risk-taking in decision-making*. The results shown in Table 1 indicate support for the predictive validity of the constructs, *Experience*, *Compliance Governance Mechanism*, and *Stakeholder Characteristics*, due to the significant association found with *reasoned risk-taking in decision-making*. However, the construct of *Educative Governance Mechanism* failed to show a significant correlation and therefore is considered to have failed the predictive validity test. This means that this factor failed to predict *reasoned risk-taking in decision-making*.

Insert Table 1 here. *Results for model with no interactions*

The results of structural analysis for the model with no interactions supported hypotheses 1, 2 and 5. Hypothesis 3 was not supported. The model explained 47% of the variance in reasoned risk-taking in decision-making and thus can be deemed adequate. Quaddus & Achjari (2005) indicate that a value of 25% or more indicates a model with adequate merit.

Insert Table 2 here. *Results for model with interactions*

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The results of structural analysis for the model with multiplicative interaction items shown in Table 2 supported hypotheses 1, 2 and 5. Hypotheses 3, 4a and 4b were not supported. The model explains 48% of the variance in reasoned risk-taking in decision-making.

Multi-group modeling

Multi-group modeling was conducted on the model without interactions, to test whether the model showed differences in applicability when divided into groups based on measures of experience. This provides an alternative method for looking at the moderating effect of the construct *Experience*. This approach tests the moderating effect of *Experience* on the model as a whole whereas the previous interactive analysis looked at the moderating effect on specific paths in the model.

Chin (2004) indicates that this can be approached by taking the standard errors for the structural paths provided by PLS-Graph in the bootstrap output and conducting a t-test for the difference in paths between groups. He recommends use of the Smith-Satterthwaite test if the variance of the samples are assumed different, as is the case in this example.

$$t = \frac{\text{Path}_{\text{sample}_1} - \text{Path}_{\text{sample}_2}}{\sqrt{\text{SE}_{\text{sample}_1}^2 + \text{SE}_{\text{sample}_2}^2}} \quad \text{with } m+n-2 \text{ degrees of freedom.}$$

Prior analyses were reviewed to determine measures of the construct *Experience* that were most suitable for a multi-group analysis. Item 4 “*Do you hold the role of principal substantively*” was a demographic item measuring experience that loaded strongly to the construct experience and met the requirements of reliability, consistency and validity for the structured equation measurement model. However, review of the descriptive statistics showed that item 4 was not suitable for multi-group analysis as the number of principals in each of the two groups, substantive principals and acting principals was too skewed, with only 13% of principals responding being in acting positions.

A multi-group analysis by item 9 “school type” was therefore conducted. Item 9 showed sound measurement properties in the Rasch analysis, but was deleted as a measure of experience as it

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was measuring type of experience and did not correlate highly with the other items. This demographic item was often referred to by principals in the preliminary interviews as being significant in whether to take risks in decision-making. It was determined that this provided a reasonable case for looking at principals in different types of schools. The original categories were regrouped into primary schools, including district schools, with 66% of responses, and secondary schools including agricultural and senior colleges, with 34%.

Insert Table 3 here. *Multi-group model by item 9 – school type*

The results of structural analysis shown in Table 3 supported hypotheses 1, 2, 3 and 5 in both the primary and secondary school groups. The model explained 52% and 59% of the variance in reasoned risk-taking in decision-making in the primary and secondary groups respectively and thus can be deemed an adequate model for each group. Multi-group analysis was conducted for paths that were found to be significant for at least one group. The multi-group t-values in the last column were found using the Smith-Satterthwaite test. Significant differences were found between the different types of schools for the structural paths of *Educative Compliance Mechanism on Reasoned Risk-taking in Decision-making* and for *Experience on Reasoned Risk-taking in Decision-making*.

Discussion and Conclusions

The results of the analyses conducted provide support for components of the hypothesised model. Overall, hypotheses 1, 2 and 5 were supported by all sections of the analysis. Both the model without interactions and the model with multiplicative interaction items showed significant evidence to support these hypotheses. Hypothesis 3 however, was not supported by the model with or without interactions. Hypotheses 4a and 4b were only supported by the multi-group analysis for a sub-group of principals. Figure 3 shows the paths with significant relationships for the research model.

Insert Figure 3 here. Research model showing supported hypotheses

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Hypothesis 1: More experienced principals will tend to engage in risk-taking behaviour more frequently than new or acting principals.

The analysis of both of the models, with and without interactions, showed that the strongest structural path within the models was between *Experience* and *Reasoned Risk-taking in Decision-making*. The hypothesis is supported with a finding of significant association. This aligns with the findings from the interviews with principals conducted in the preliminary qualitative phase of the research where experienced principals more often indicated that they preferred greater flexibility to make decisions at the school level to meet outcomes that took account of local circumstances. Evidence from principals' responses in the 2003 review (Trimmer, p.34) emphasised the diversity that exists between geographical locations and types of schools, with principals needing the flexibility to make decisions that take account of local school and community circumstances, including geographical and cultural factors. They expressed a preference for minimal mandatory policy and procedures as they were of the view that their professional expertise would provide sufficient basis for best achieving required outcomes (Trimmer, 2003a).

This association between *Experience* and *Reasoned Risk-taking in Decision-making* was consistent across principals from all school types in the multi-group analysis, but was greater for primary schools. The multi-group analysis divided by school type showed that greater experience influenced risk-taking in decision-making more for primary school principals. However, the difference between groups was not significant. In contrast, in the preliminary qualitative interviews, secondary school principals more often indicated that they preferred flexibility in decision-making and expressed the view that they had the capacity to make the most appropriate decisions to meet required outcomes in their schools. A possible explanation that accounts for both of these findings is that secondary principals of all levels of experience are more likely to engage in risk-taking in decision-making.

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The effect of experience is still apparent for secondary principals but may be more pronounced for primary school principals if they are less likely to take risks.

This explanation could be tested through follow-up research that looked more closely at the differences in risk-taking in decision-making in different school types. A subsequent alternative hypothesis for future research could be: Principals with secondary school experience tend to engage in risk-taking behaviour more frequently than primary principals.

Hypothesis 2: Where school principals interpret the governance mechanism of the regulatory framework as a compliance mechanism there will be a negative relationship to reasoned risk-taking.

Hypothesis 2 was supported by all sections of the analysis. Both the model without interactions and the model with multiplicative interaction items showed significant evidence to support this hypothesis with a strong negative path coefficient. Principals in both primary and secondary schools, with a compliance view of the governance mechanism, were less likely to take reasoned risks in decision-making.

This finding aligns with research conducted over many years on the effect of autonomy and control in decision-making in organisations (Libby & Fishburn, 1977; Vlek & Stallen, 1980; Sitkin & Pablo, 1992; Cooke & Slack, 1991; Child, 1997; Reeve, Nix & Hamm, 2003). It is also consistent with research on the effect of governance structures in education (Minor, 2004; Hoy & Miskel, 2005; Caldwell, 2006; Panova, 2008) that indicates that centralised control of decision-making, level of autonomy and principals' perceptions of preferences of the organisation influence decision-making to minimise risk-taking. The concerns raised by principals (Trimmer, 2003a) regarding public accountability and scrutiny of decisions as both politically and legally defensible are also supported by this finding as such concerns reduce the propensity of principals to expose themselves to risk in decision-making.

Hypothesis 3: Where school principals interpret the governance mechanism of the regulatory framework as an educative mechanism there will be a positive relationship to reasoned risk-taking.

Hypothesis 3 was not supported in the analysis of either model, with or without interactions. However, the multi-group modelling did show significant paths for the effect of *Educative Governance Mechanism* on *Reasoned Risk-taking in Decision-making* for some groups of principals. A significant negative effect was found for secondary principals. This result is contrary to what was anticipated. These results are discussed under Hypothesis 4 below.

Hypothesis 4a: There will be an interaction effect between perception of the regulatory framework and experience such that the relationship between the compliance mechanism and reasoned risk-taking is moderated negatively by the experience of principals.

Hypothesis 4b: There will be an interaction effect between perception of the regulatory framework and experience such that the relationship between the educative mechanism and reasoned risk-taking is moderated positively by the experience of principals.

Hypotheses 4a and 4b were not supported by the analysis of the model with interaction items. However, there were mixed results for the multi-group analysis that provide some support for the hypotheses.

Consistent with results of the multi-group analysis divided by school type for hypothesis 1, effect size for principals in primary schools who may be more averse to risk taking in decision-making was greater. There was a negative relationship between compliance view and risk taking for principals of all school types that was greater for principals in primary schools. However, this difference was not significant. This provides support for conduct of an additional investigation of

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whether principals with secondary school experience tend to engage in risk-taking behaviour more frequently than primary principals.

Principals in secondary schools with an educative view were less likely to engage in risk-taking in decision-making, whereas principals in primary schools with an educative view of governance mechanisms were more likely to do so. This supports hypothesis 4b for primary principals only. This finding was unexpected and does not support hypothesis 4b for secondary school principals. The relationship between secondary principals' views and risk taking in decision-making does not have the same impact as for other principal types. The tendency for secondary principals to take greater risks in decision-making regardless of their view of the governance mechanism appears to dominate.

Hypothesis 5: Principals of schools with a high degree of uniqueness in the characteristics of key stakeholders within the communities will be more likely to make decisions involving reasoned risk-taking.

Hypothesis 5 was supported by all sections of the analysis. Both the model without interactions and the model with multiplicative interaction items showed significant evidence to support this hypothesis.

Principals in all types of schools with a high degree of uniqueness were more likely to make decisions involving reasoned risk-taking but there was no significant difference between primary and secondary schools. This supports hypothesis 5. Similarly, in the multi-group analysis by items 30 and 31, principals in schools with a high degree of uniqueness were more likely to make decisions involving reasoned risk-taking regardless of their level of experience, providing support for hypothesis 5.

These results are consistent with comments made by principals in interviews (Trimmer, 2003a). The results align with the education literature (Bennis & Nanus, 1985; Hallinger & Heck,

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1999; Anderson & Minke, 2007; Fullan, 2007) on the importance of the role of parents and the school community in contributing to decision-making in schools. The results also reflect long established research undertaken in business contexts (Beatty & Zajac, 1994; Carpenter & Westphal, 2001; Carpenter, Pollock & Leary, 2003; Gilley, Walters & Olson, 2002) on the impact of stakeholders on management decisions. There are significant implications in Western Australian government schools that include many schools with highly diverse populations, and schools in remote locations catering to Indigenous students.

Agency theory

The organisational functions of decision management and decision control are quite separate in the structure of the Department of Education in Western Australia. Principals in individual schools are responsible for decision management, which includes the initiation and implementation of decisions on a daily basis. However, decision control, which includes the ratification and monitoring of these decisions, is the responsibility of district and central offices. This structure reflects that described by Fama and Jensen (1983) for complex organisations, where organisational rules are in place to monitor and constrain the decision behaviour of agents. The Department has a hierarchical administrative structure with an administrative centre that controls the development of the policies and procedures that make up the governance mechanism of the regulatory framework. This governance framework is compulsory for principals to use in their local decision-making processes in their individual schools. The strategic management structure is such that it reflects a business that can be interpreted from the perspective of agency theory (Jensen & Meckling, 1976; Fama & Jensen 1983; Jensen, 1986; Rumelt, Schendel & Teece, 1991). The attitudes and behaviour of principals as measured through the administration of the questionnaire in this study and the support for Hypotheses 1, 2 and 5 provides some evidence that principals will take risks when they perceive that

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the requirements of the regulatory framework will constrain the outcomes they seek to attain for the students in their school.

In terms of agency theory, as espoused by Fama and Jensen (1983), the principals are responsible for decision management but not the decision control. There is a decision hierarchy, the regulatory framework, in place against which decisions are ratified and against which principals' performance is monitored by district directors on behalf of the Director General. The results of this study are consistent with the expectations of agency theory as it was found, through support for Hypothesis 5, that school principals make management decisions that take account of the needs of their individual school and community. It is likely that in circumstances where principals perceived a conflict between the desired outcomes for their school and the requirements of the regulatory framework they were prepared to take risks in decision-making.

Support for behavioural model of risk-taking in decision-making

Theories of decision-making that incorporate constructs such as behavioural models (Hambrick & Mason, 1984; Wiseman & Gomez-Meija, 1998) provide a useful perspective to explain why principals focus on restricted outcome choices when making decisions rather than taking account of all possibilities as predicted by utility theory. These theories of decision-making are supported by the finding that principals' perspectives of the governance framework as a compliance mechanism significantly affected risk-taking in decision-making. These theories provide a comprehensive view of managerial risk-taking that is impacted by the decision-makers' experience, including their knowledge and values, their perspective of the purpose of the governance framework and the framing of the situation as positive or negative. The findings of this study are consistent with these behavioural models of risk-taking in decision-making. The construct *Experience* in this study included aspects related to whether appointment to the position of principal was substantive; length of time in the role; the relevance of experience to current decision-making situations; past success in

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taking risk in making decisions; past negative experience and personal tendency to risk aversion; and type of experience such as primary or secondary school

Leadership and decision-making in schools

Experienced principals are more likely to take risks in decision-making to achieve desired outcomes. This aligns with the literature on effective leadership in schools. For example, Mendez-Morse (1992) identified willingness to take risks as one of the characteristics common to successful leaders of educational change. Similarly, risk-taking has been identified by Fullan (1993) and Caldwell (2006) as a significant factor in educational leadership. The contrast in risk-taking behaviour required for management and leadership decision-making was highlighted by Silcox (2003) in the context of school renewal. Silcox indicated that management required low risk decisions based on established procedures, whereas leadership required higher risk decisions to find solutions in uncertain situations. This distinction is useful in considering why experienced principals take more risks, and also why principals with a compliance view of the governance mechanism take less risks in decision-making. Less experienced principals with a compliance view of the framework may be making low risk decisions that focus on management processes within the school. More experienced principals, on the other hand, are able to make such decisions routinely and have greater capacity to undertake school renewal and educational change agendas within their schools. Decisions related to these high level educational outcomes are not routine and hence require greater risk in determining potential strategies in the decision-making process.

Further Research

The number of compulsory policies and procedures in the regulatory framework has continually increased over the past decade maintaining a centralised hierarchical control of decision-making in Western Australian public schools. However, the current changes occurring in Western Australia

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acknowledge that increased autonomy may be advantageous for decision-making in some public schools. With a license to operate outside of the governance mechanism of the regulatory framework that currently controls their decision-making processes, these schools have greater autonomy. While there is little public information regarding selection criteria or measures to monitor success, they present an exciting opportunity for future research. This initiative may assist the schools involved to have greater capacity and flexibility to undertake decision-making specific to their identified school needs without the risks of non-compliance with centralised policy. It would be of interest to study whether these schools make decisions that are significantly different from those who remain constrained by policy mandated in the regulatory framework.

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Table 1

Results for model with no interactions

<i>Hypothesis</i>	<i>Standardised Path Coefficient</i>	t-value
Compliance → Reasoned Risk-taking in decision-making	-0.323	3.55**
Educative → Reasoned Risk-taking in decision-making	-0.004	0.05
Experience → Reasoned Risk-taking in decision-making	0.384	4.54**
Stakeholder Characteristics		
→ Reasoned Risk-taking in decision-making	0.177	2.43*

** p<0.005; * p<0.01

R² for Reasoned Risk-taking in decision-making = 0.477

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Table 2

Results for model with interactions

<i>Hypothesis</i>	<i>Standardised Path</i>	t-value
	<i>Coefficient</i>	
Compliance → Reasoned Risk-taking in decision-making	-0.223	2.08 ^{**}
Educative → Reasoned Risk-taking in decision-making	-0.055	0.55
Experience → Reasoned Risk-taking in decision-making	0.274	2.38 [*]
ComplianceXExperience → Reasoned Risk-taking in decision-making	0.15	1.19
EducativeXExperience → Reasoned Risk-taking in decision-making	0.029	0.32
Stakeholder Characteristics → Reasoned Risk-taking in decision-making	0.164	2.27 [*]

** p<0.005; * p<0.025

R² for Reasoned Risk-taking in decision-making = 0.483

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Table 3

Multi-group model by item 9 – school type

Hypothesis	<i>Primary and DHS</i> (<i>n=89</i>)		<i>Secondary (n=47)</i>		Multi group t-value (df=134)
	Standardise d Path Coefficient	t-value	Standardise d Path Coefficient	t-value	
Compliance → Reasoned Risk-taking in decision-making	-0.394	4.82***	-0.256	1.53*	0.74
Educative → Reasoned Risk-taking in decision-making	0.108	1.26	-0.275	1.77**	2.31**
Experience → Reasoned Risk-taking in decision-making	0.431	4.77***	0.158	1.64*	1.55*
Stakeholder Characteristics → Reasoned Risk-taking in decision-making	0.251	2.82***	0.335	1.91**	0.43
R² for Reasoned Risk- taking in decision- making	0.521		0.598		

*** p<0.005; ** p<0.05; * p<0.10

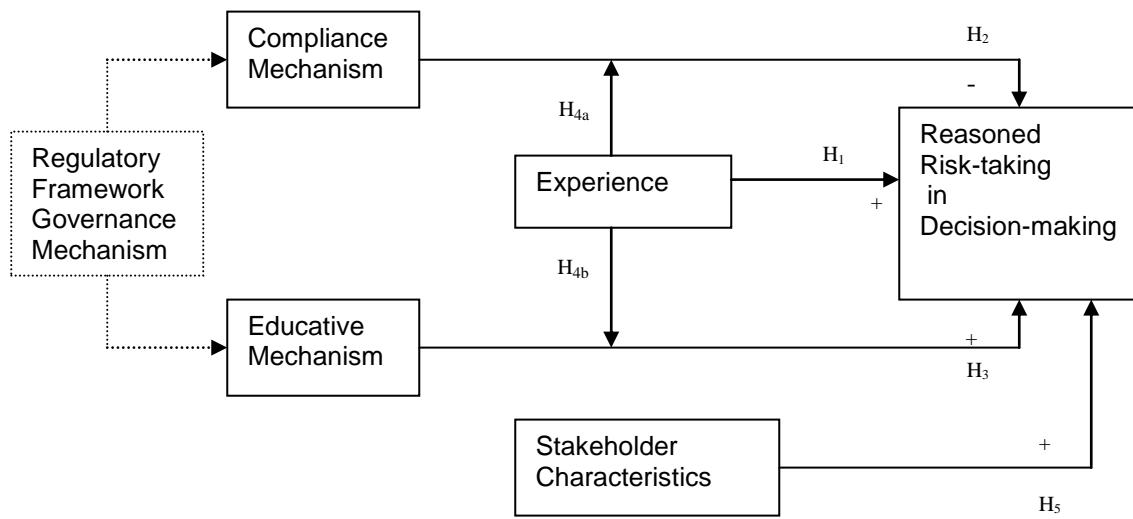
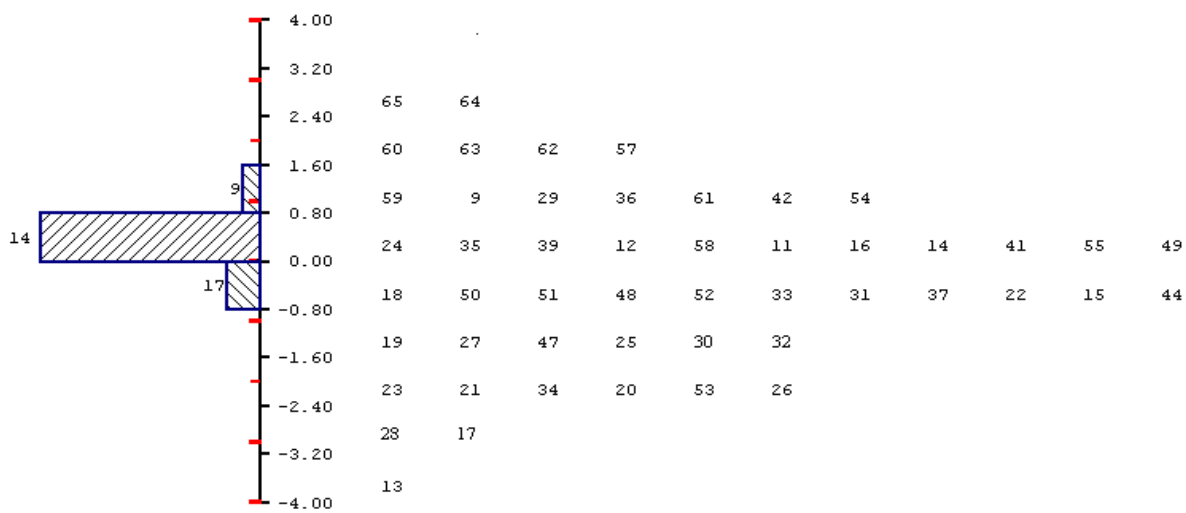


Figure 1. Research Model

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Persons

Item Locations

Figure 2. Item Map showing the person/item distribution with the items identified

Demographic items 1 – 12, attitude items 13 – 47, and behaviour items 48 – 61.

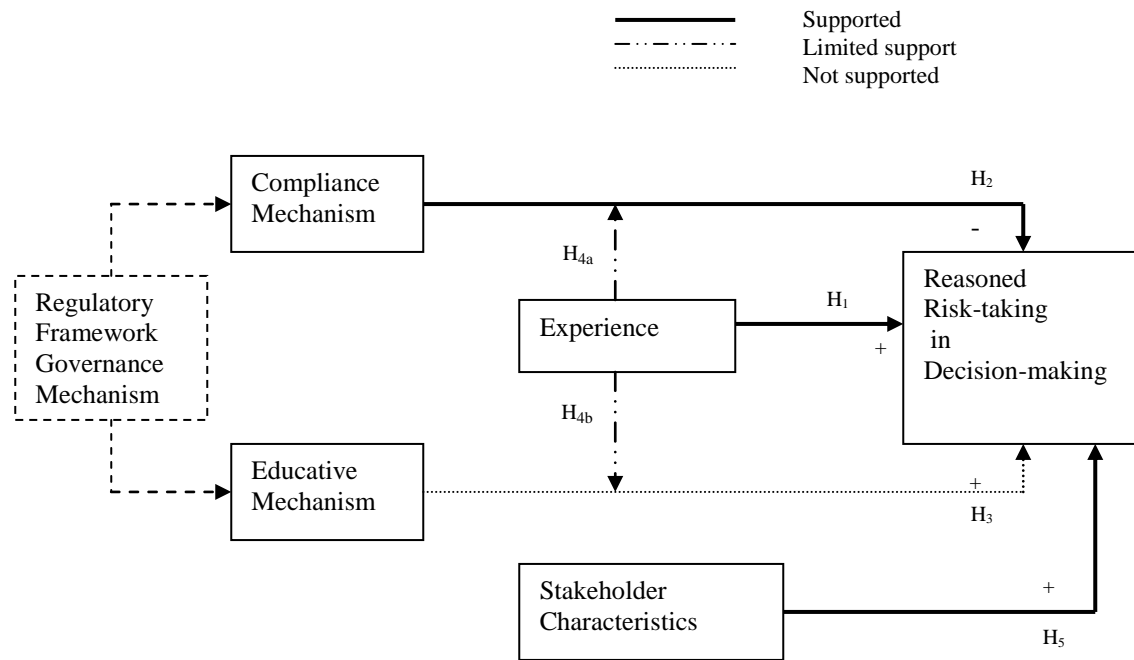


Figure 3. Research model showing supported hypotheses